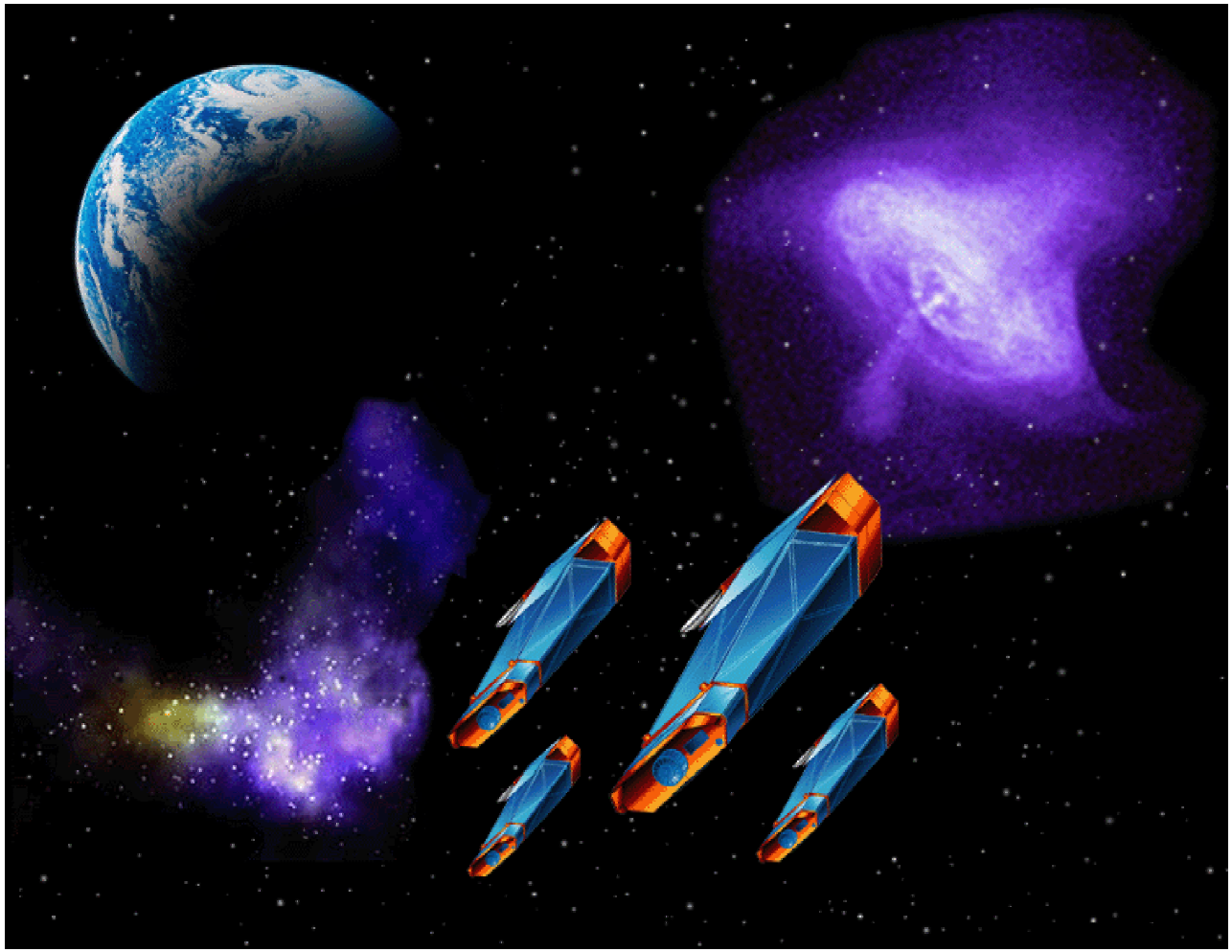
Constellation X-ray Mission Configuration



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http://constellation.gsfc.nasa.gov

Reference Mission Configurations

- **Reference configuration developed for demonstration of feasibility, establishment of technology requirements and development of cost estimates**
- **Four satellites in mission; launched two at a time on an Atlas V, Delta IV or Delta II**
- **For Atlas V and Delta IV configurations each satellite has:**
  - One Spectroscopy X-ray Telescope (SXT) with a 1.6 meter optic
  - Three Hard X-ray Telescopes (HXT) with 0.4 meter optics
  - One Optical Bench provides 10.0 meter focal length for SXT and HXT and retracts to accommodate dual launch
  - One Calorimeter Detector Assembly at SXT focus cooled by Turbo-Brayton Cryo Cooler with ADR to 50 mK
  - One Gratings Assembly, aft of SXT Optic, disperses X-rays onto an array of eight CCD's located on Rowland Circle
  - One CdZnTe Detector Assembly for each HXT
  - Separable spacecraft bus and instrument modules

Resource Summaries

- **Mass Estimate**

Item	Satellite Mass (Kg)	Launch Mass (Kg)
Instrument Module	1524	3048
Wet Spacecraft Bus	884	1768
Margin		1334
Total Launch Mass		6150
Estimated Atlas V-551 Net Launch Capability C3 = -2.6		6150

- **Power Estimate Per Satellite**

Average Satellite Power Requirement	814 Watts
End of Life Power Capability	1100 Watts

- **Telemetry Estimate per Satellite**

S-Band Telemetry (Housekeeping Data)	2 Kbps
X-Band Telemetry (Science Data)	1.7 Mbps
Telemetry Down Link Time Approximately	1 hour/day

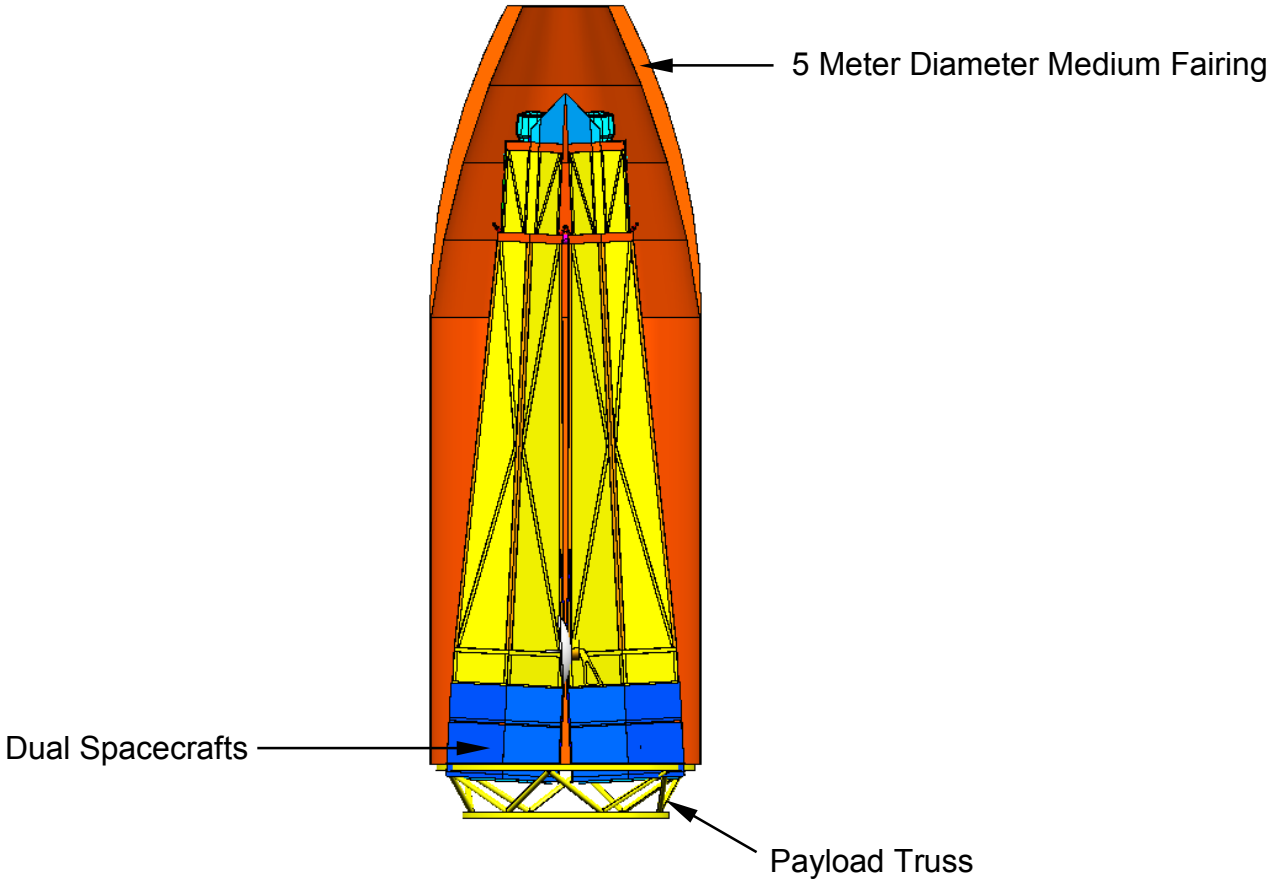
New Fixed Optical Bench Configurations

- **Two fixed optical bench satellites in Atlas V launch vehicle**
  - Components similar to previous Reference Extendible Configuration
  - Reduced mass due to elimination of Dual Payload Adopter and optical bench deployment mechanism
  - Solves insulation issues and meets light tight requirements
  - Facilitates alignment and test
- **Two one stage (instead of multiple stages) extendible bench satellites in Delta IV launch vehicle**
  - One stage to accommodate medium vehicle
  - Same advantages as listed above

Delta II Configuration

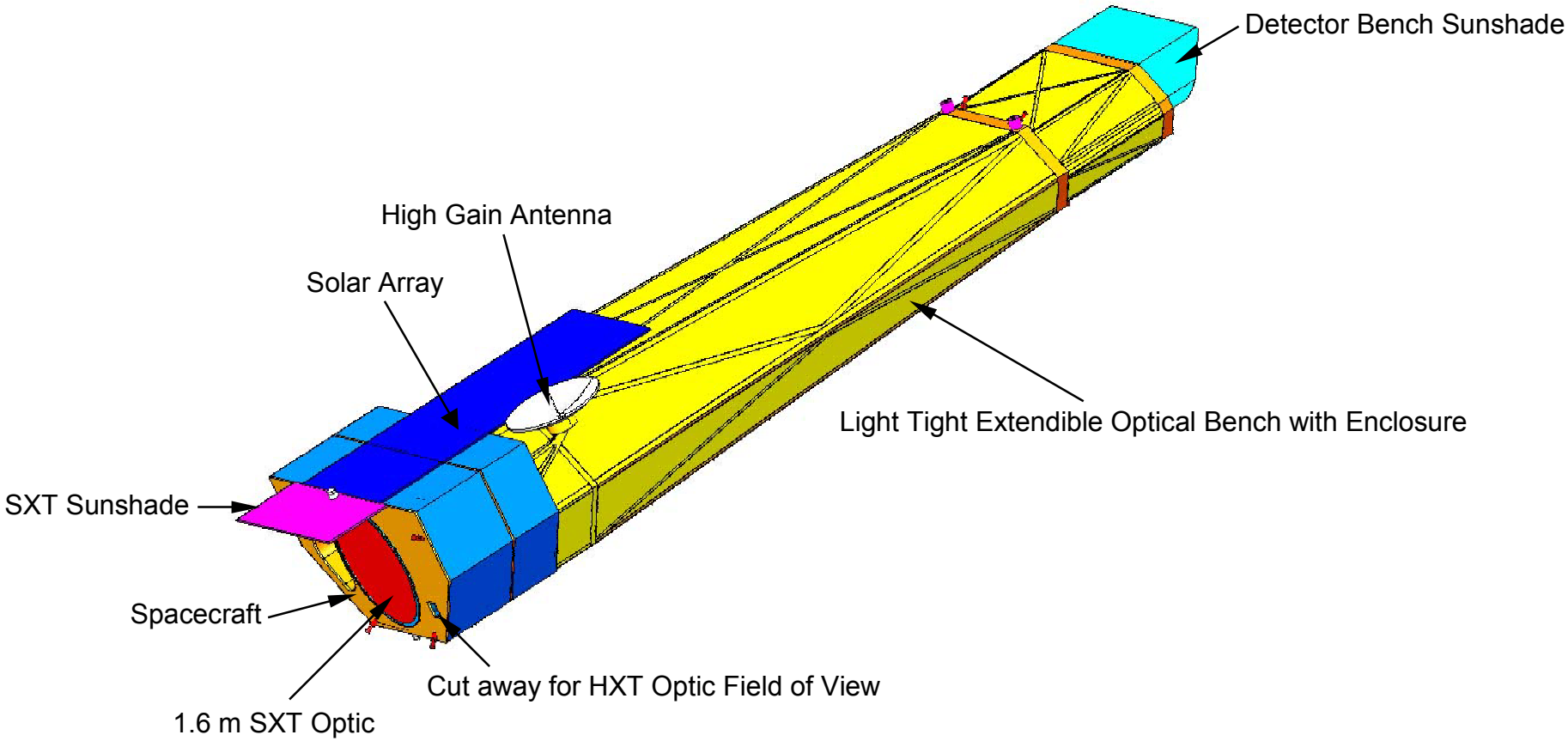
- **Four identical satellites in extendible optical bench configuration to be launched in four 2920-10L Delta-II launch vehicles**
- **Injection orbit is circular orbit with 1000 km altitude**
- **Use solar electric propulsion to get to L2 libration point**
  - Uses two 290 mN thrust capable SEP engines
  - Requires solar array capable of generating 10 kw
- **The optics configuration for each of the satellites is as follows:**
  - One 1.5 meter diameter SXT
  - Five 33 centimeter diameter HXTs
- **The payload mass is 1200 Kgs vs 1309 Kgs in the reference configuration**

Atlas V Launch Vehicle Configuration

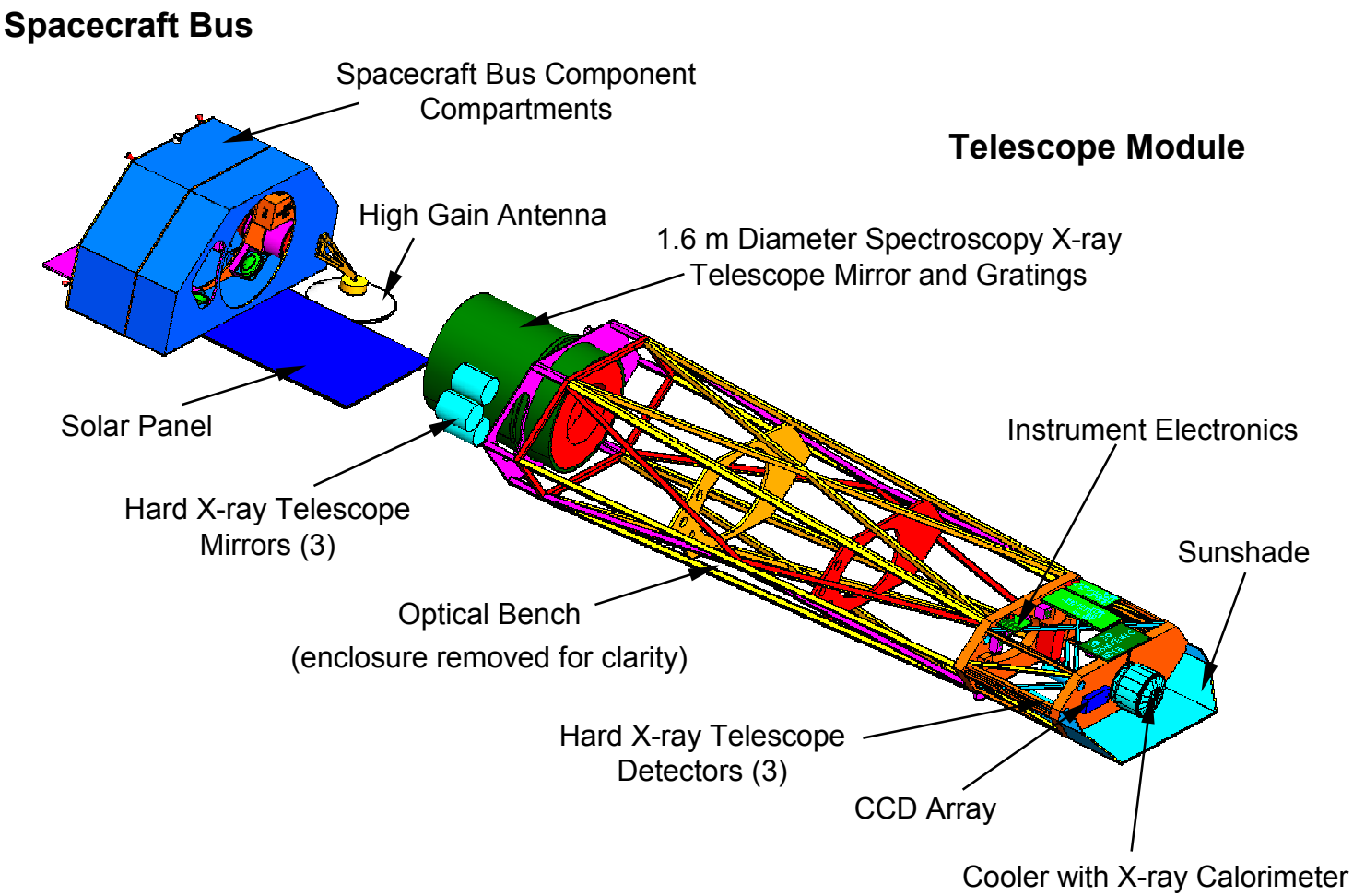


Atlas V Dual Manifest Launch Configuration - Side View

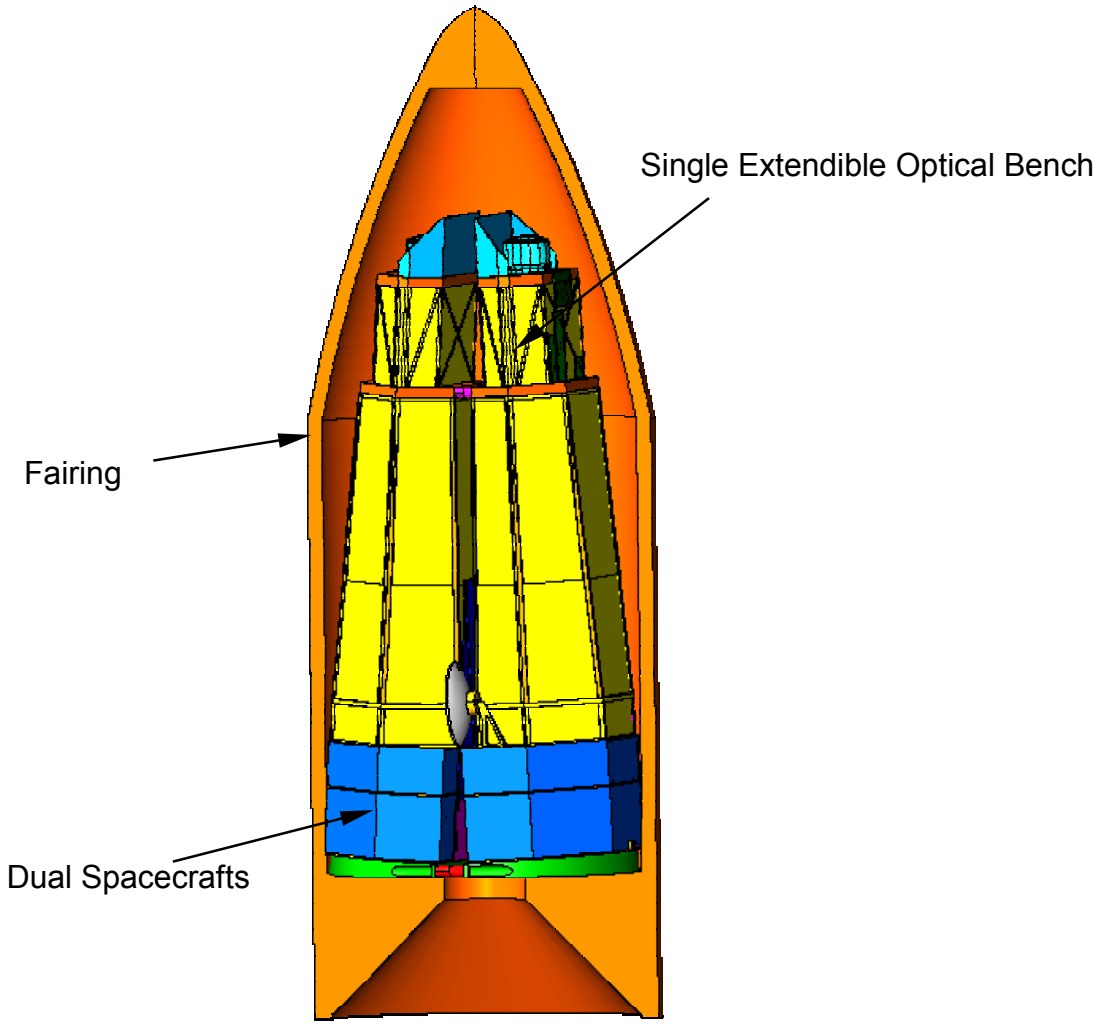
Reference Configuration



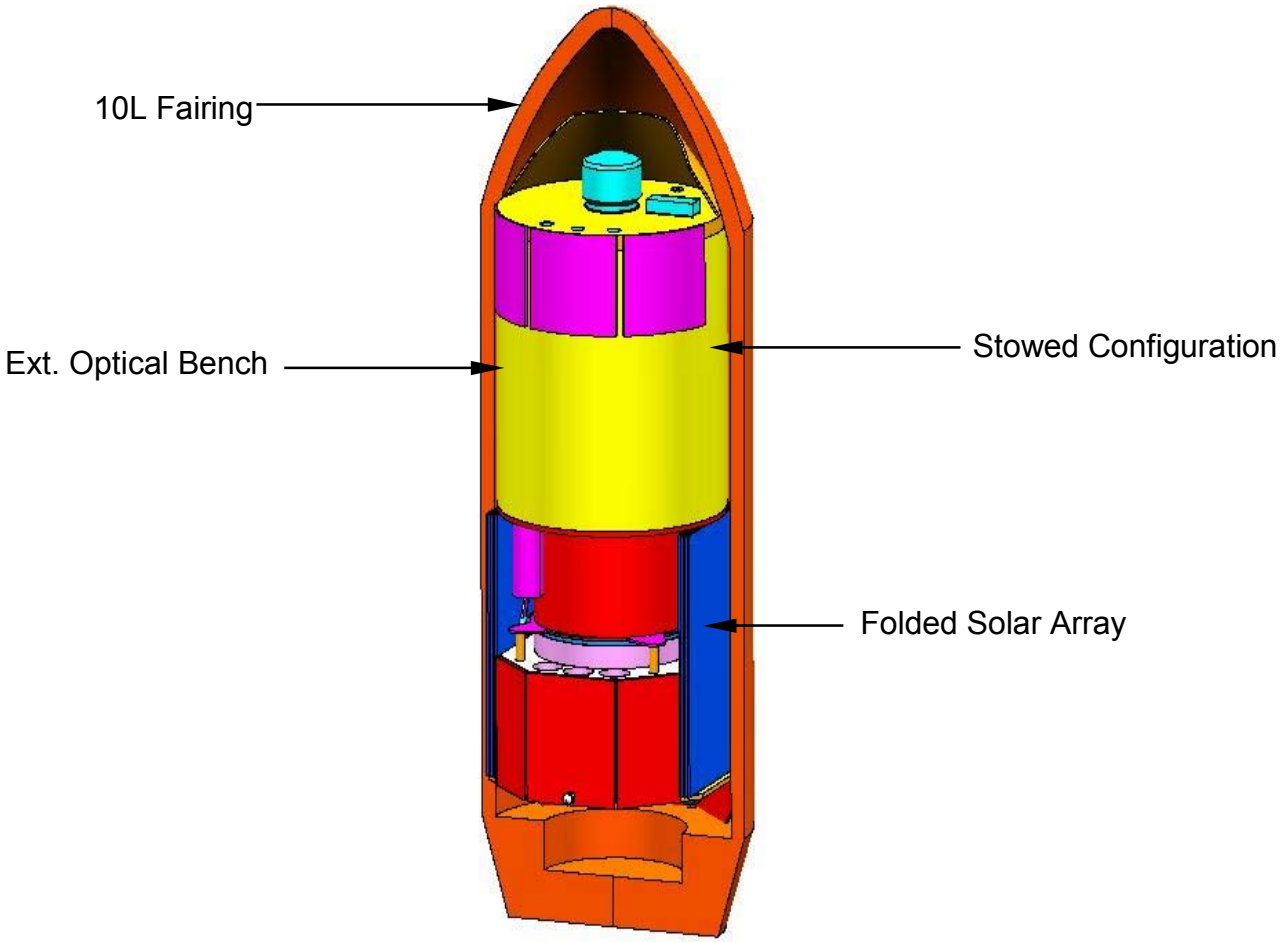
Reference Configuration View from Detector End



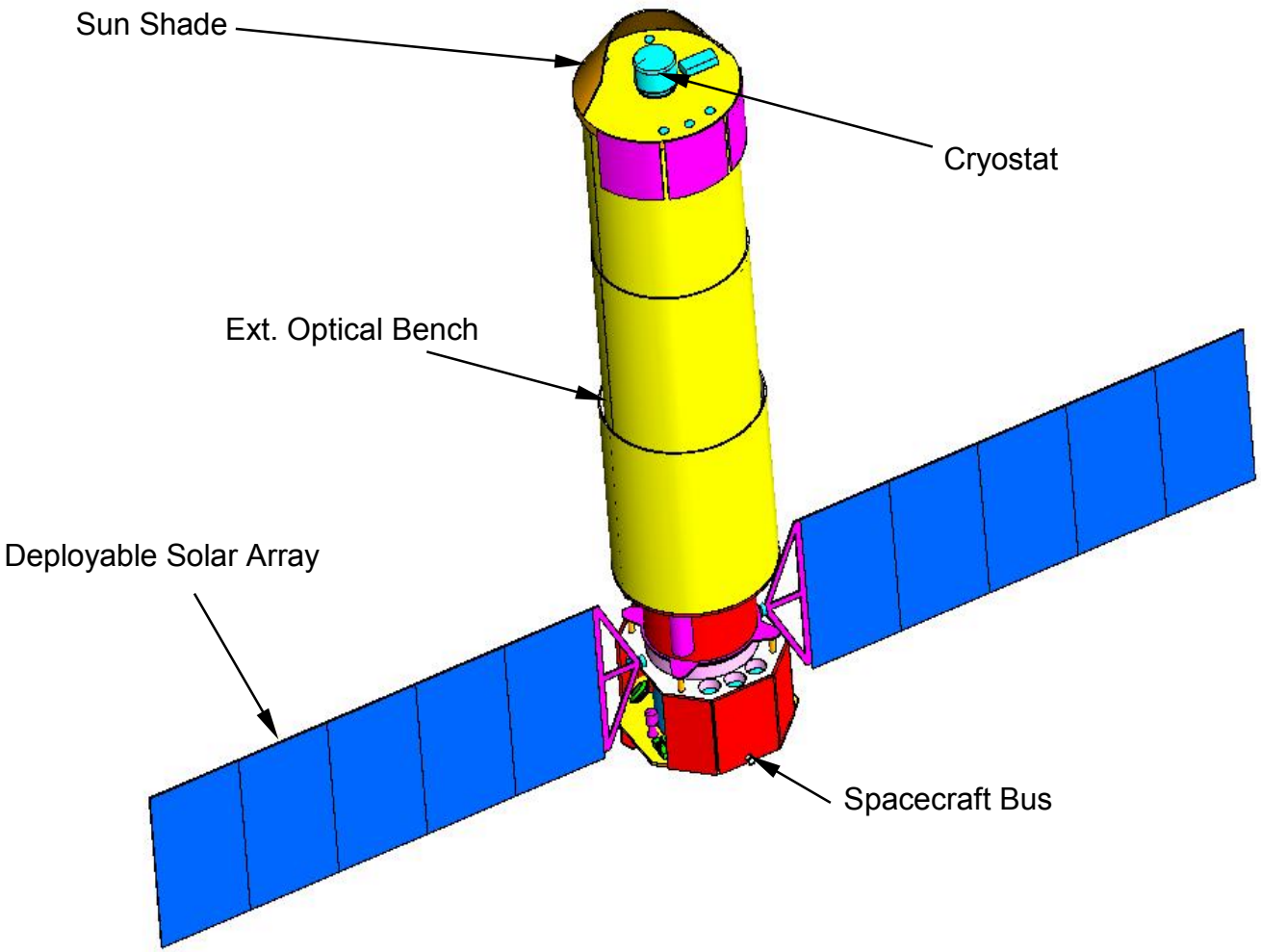
Delta IV Launch Configuration



Delta II Launch Configuration



Delta II Deployed Configuration



Delta II Launch Option Comparison

4 Satellites on 2 ATLAS V or DELTA-IV	4 Satellites on 4 DELTA-II
Uncertain LV	Credible LV
Two LVs	Four LVs
130 Days to L2	450 Days to L2
Hydrazine Prop	Solar Electric Prop
1.6 meter optic	1.5 meter optic
1308 Kg Payload	1200 Kg Payload
Lowest Cost	Medium Cost

Reference Configuration View from Optics End